magnitude and direction of movement, and their relation to areas of low pressure. The latter subject is illustrated with a plate giving the isobars for December 15, 1882, in the northern hemisphere, and it is shown generally that the movement of areas of high pressure depends upon very different causes from that of areas of low pressure, which seem to be endowed with a power of locomotion residing within themselves. Areas of high pressure exhibit no such power, their movement seeming to depend entirely on external forces.—The faults of South-West Virginia, by John J. Stevenson. Here is given a summary of the information communicated by the author in several memoirs read before the American Philosophical Society (1880-84) on a reconnaissance made by him of the faulted region in Virginia from the Tennessee line to nearly twenty miles beyond New River, a total distance of 150 miles.—On Taconic rocks and stratigraphy, with a geological map of the Taconic regions, part 2, by James D. Dana. The general facts are here detailed which bear on the geographical distribution of the limestone and other rocks. A description is given of Williamstown, regarded as the birthplace of the Taconic system, and it is shown generally that the great quartzite formation, forming the foundation of the Palæozoic of the region, derived its material from Archæan formations of the vicinity and not from the fabled "Atlantis" as some geologists have supposed.—Irish esker drift, by G. H. Kinahan. It is pointed out that, in common with some other observers, Prof. Carvill Lewis confounds true esker drift and ridges of esker-like drift. His statement in the December number of the *American Journal of Science* that the Irish eskers appear to be adjuncts of the melting of the ice-sheets is shown to be impossible.—Physical characteristics of the northern and north-western lakes, by L. Y. Schermerhorn. The results are given of the lately completed surveys made by the United States of all the great lakes draining through the St. Lawrence to the Atlantic. The total water-area is 95,275, and the total area of the lacustrine basin over 270,000, square miles. The length of shore-line with connecting rivers is about 5400 miles, the extreme depth of Superior 1008 feet, or over 406 below sea-level, the mean annual rainfall of the whole basin 31 inches, the volume of water in the lakes about 6000 cubic miles, and the discharge of Ontario at St. Lawrence River 300,000 cubic feet per second.—Mineralogical notes from the laboratory of Hamilton College, by Albert H. Chester. Specimens are described and analysed of fuchsite, pink celestite, zinkenite, brochantite, pectolite, crystals of barite, scorodite, and bismuthite.—The topography and geology of the Cross Timbers and surrounding regions in Northern Texas, by Robert T. Hill. This wooded zone penetrating in two belts from Indian territory through the surrounding prairie southwards to 32° N. lat., is explained by the detritus of arenaceous strata which occupy well-defined horizons in the geological series, and which have been exposed by the denudation of the overlying strata.—American Jurassic mammals, by Prof. O. C. Marsh. In this paper are described the remains of several hundred individuals which have come to light since the appearance of the author's previous papers on the subject. Although fragmentary, the remains are usually well preserved, comprising the lower jaws, teeth *in situ*, various portions of the skull, vertebræ, and other parts of the skeleton. Placental as well as marsupial mammals occur in the oldest formations, whence the inference that the former do not derive from the latter evolutionally, as is supposed, but that both of these orders descend in independent lines from a common ancestor.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, March 24.—"On the Magnetisation of Iron in Strong Fields." By Prof. J. A. Ewing, University College, Dundee, and William Low.

The behaviour of iron and steel when subjected to very strong magnetising forces is a matter of considerable practical and very great theoretical interest, especially from its bearing on the molecular theory of magnetisation, which assigns an upper limit to the intensity of magnetism that a piece of iron can acquire, and even suggests that the metal may become diamagnetic under the influence of a sufficiently great force. All experiments hitherto made, by magnetising iron in the field of an electric solenoid, have shown that the intensity of magnetism, $\mathfrak{I}$, as well as the induction, $\mathfrak{B}$, is increasing with the highest values actually given to the magnetising force, $\mathfrak{H}$. It is scarcely practicable, however, to produce by the direct action of a magnetising solenoid, a field whose force exceeds a few hundreds of C.G.S. units.

In the space between the pole-pieces of a strong electro-magnet we have a field of force of much greater intensity than it is practicable to produce by the direct action of the electric current. This field is not well adapted for experiments whose object is to determine with precision the relation of magnetisation to magnetising force, on account of the distortion which it undergoes when the piece of iron to be magnetised is introduced into it. It is, however, well suited for experiments whose object is to determine how much magnetism the metal can be forced to take up.

In the authors' experiments, bobbins of Lowmoor and Swedish wrought-iron and cast-iron were magnetised by placing them between the pole-pieces of a large electro-magnet. The bobbins consisted of a short narrow central neck with conical ends. The magnetic induction in the neck was measured ballistically by means of an induction coil, consisting of a single layer of fine wire, wound on the neck; and the magnetic field in the air-space immediately contiguous to the neck was also measured by means of a second induction coil wound over the first, and of slightly greater diameter. This enabled the non-ferrous space under the inner induction coil to be corrected for, and also gave an approximation to the value of $\mathfrak{H}$, the magnetic force acting on the metal. The magnetic force varied up to about 11,000 C.G.S. units, and the highest induction observed (in a sample of Lowmoor wrought-iron) was 32,880 C.G.S. units. In some instances the magnetic induction was observed by withdrawing the bobbin; in others the bobbin was turned round suddenly so that its magnetism was reversed. The following results refer to Lowmoor wrought-iron and to cast-iron.

Lowmoor wrought-iron

Field round iron neck per sq. cm.	Magnetic induction in the metal	Current in field magnets, amperes	$\frac{\mathfrak{B} - \text{outside field}}{4\pi}$	$\frac{\mathfrak{B}}{\text{outside field}}$
3,630	24,700	1·98	1680	6·80
6,680	27,610	4·04	1670	4·13
7,800	28,870	5·81	1680	3·70
8,810	29,350	7·60	1630	3·33
9,500	30,200	11·0	1650	3·18
9,780	30,680	13·5	1660	3·14
10,360	30,830	16·2	1630	2·98
10,840	31,370	21·6	1630	2·89
11,180	31,560	26·8	1620	2·82

Cast-iron

Field round iron neck per sq. cm.	Magnetic induction in the metal	Current in field magnets, amperes	$\frac{\mathfrak{B} - \text{outside field}}{4\pi}$	$\frac{\mathfrak{B}}{\text{outside field}}$
3,900	19,660	1·97	1250	5·04
6,400	21,930	3·75	1240	3·42
7,710	22,830	5·38	1200	2·96
8,080	23,520	7·08	1230	2·91
9,210	24,580	13·15	1220	2·67
9,700	24,900	16·9	1210	2·57
10,610	25,600	22·6	1190	2·46

The magnetic force within the metal ($\mathfrak{H}$) differs from the field in the surrounding space by an amount which cannot be estimated without a knowledge of the distribution of free magnetism on the pole-pieces and conical faces of the bobbin. It appears probable that, with the dimensions of the various parts used in these experiments, the magnetic force within the metal is less, but not very greatly less, than the outside and closely neighbouring field. In the absence of any exact knowledge of $\mathfrak{H}$, it is interesting to examine the relation of $\mathfrak{B}$ to the outside field. Thus, ($\mathfrak{B}$ – outside field)/4π gives a quantity which is probably not much less than the intensity of magnetism, $\mathfrak{I}$. The values of this quantity and also of the ratio $\mathfrak{B}$/outside field for Lowmoor wrought-iron and cast-iron are stated in the tables above.

Curves are given showing the relation of $\mathfrak{B}$ to $\mathfrak{B}$/outside field for Lowmoor iron and for cast-iron, in the manner introduced by Rowland for showing the relation of $\mathfrak{B}$ to μ (the permeability). The curves have the same kind of inflection that a curve of μ and $\mathfrak{B}$ begins to have when the magnetising force is raised sufficiently high. The range through which the permeability of iron may vary is well shown by comparing the values reached here (probably in the extreme case less than 3) with the value 20,000, which was found by one of the authors in the case of a soft wire exposed to a very small magnetising force and kept at the same time in a state of mechanical vibration.

The experiments give no support to the suggestion that there is a maximum of the induction, 𝔅. The value of 𝔅 capable of being reached by the method here employed depends mainly on the scale of the experiments. Larger field magnets with pole-pieces tapering to a narrow neck should yield values of 𝔅 greatly in excess even of those that were observed.

Linnean Society, April 7.—Mr. William Carruthers, F.R.S., President, in the chair.—Mr. Hunter J. Barron, Mr. Jas. H. Dugdale, and Mr. Edwd. B. Poulton were elected Fellows of the Society.—Fresh specimens were exhibited of a pure white variety of primrose, which had been gathered, growing wild, near Biarritz, France, by Mr. W. D. Godolphin Osborne.—A large series of instantaneous photographs of storks nesting, &c., were exhibited for Mr. E. Bidwell. These had been taken in Germany, and were specially interesting as showing the peculiar attitudes assumed in flight, &c.—Some malformed trout in an early stage of development were shown and commented on by Dr. F. Day.—A paper was read by Prof. Huxley on "The Gentians; Notes and Queries." Taking the flower as a basis, he divides the Gentianeæ into two great series, each of which is characterised by a peculiar disposition of the nectarial organs, and a gradation of forms of the corolla from the deeply cleft rotate or stellate condition, through the campanulate to the extreme infundibulate kind. In one series termed (I.) Perimelitæ, the nectarial cells are aggregated in a single or two patches; in the other series (II.) Mesomelitæ, the distinguishing characters are a zone of secreting cells encircling the ovary, or absence of such, with presence of a honey-secreting surface which may exist in the central parts of the flower. He assumes, on morphological grounds, a hypothetical ancestral flower or Ur-Gentian = Hapianthe. As a starting-point, this would lead, on the one hand, to the series of Perimelitaæ, with four subsidiary types; and on the other to the Mesomélitæ, also with four subsidiary types of floral structure. The Perimelitæ comprise the groups:—1. Actinanthe, 2. Keratanthe, 3. Lophanthe, and 4. Stephananthe; the Mesomelitæ comprise:—1. Asteranthe, 2. Limnanthe, 3. Lissanthe, and 4. Ptychanthe. The one series appears to bear a certain progressive relation in its evolution to the leading morphological modifications of the opposite series. In treating of the geographical distribution of the gentians, Prof. Huxley adopts the lines previously followed by him on animal distribution. Under (I.) Arctogea he includes Europe, Africa, Asia, and North America as far as Mexico; South Africa, Madagascar, Hindostan, and Indo-China forming a sub-province = South Arctogea; the remainder = North Arctogea. (II.) Austro-Columbia comprises South America, isthmus and islands as far north as Mexico. (III.) Australia is another province; and (IV.) New Zealand with adjoining islands. Species of the Gentianeæ are found in all these provinces, the head-quarters being North Arctogea and Austro-Columbia. The Ptychanthe are predominant in North Arctogea; the Lissanthe in South Arctogea; and Actinanthe, Lophanthe, and Lissanthe in Austro-Columbia. In Australia and New Zealand there is a paucity of species. He considers that the present distribution of the Gentianeæ is not to be accounted for by migration from any given centre, whence diffusion to their present localities. Borrowing analogy from zoological distribution, he likens the gentians to the tapirs, at present only represented in South America and the Indo-Malayan region. Yet the Tapiridæ in the Middle Tertiary epoch were distributed everywhere in the intermediate areas. Though fossil remains of gentians are not yet known, Prof. Huxley nevertheless suggests that in Pliocene and Miocene times their distribution may have been substantially similar to what is now extant. He further throws out the hint that, could the age of the first appearance of dipterous, hymenopterous, and lepidopterous insects provided with long haustra be indicated, we should then be in a position to guess approximately when specialisation of the types of the gentians and their ultimate distribution occurred.

Geological Society, April 6.—Prof. J. W. Judd, F.R.S., President, in the chair.—The following communications were read:—On the rocks of the Malvern Hills, part 2, by Mr. Frank Rutley. The details of the microscopic examination of the rocks constituted the principal part of the present paper. The author concluded that the rocks of the Malvern Hills represent part of an old district consisting of plutonic and, possibly, of volcanic rocks associated with tuffs, sedimentary rocks composed mainly or wholly of eruptive materials, and grits and sandstones; that the structural planes in these rocks (sometimes certainly, at others possibly) indicate planes of stratification, and that the foliation, in many cases if not in all, denotes lamination due to deposition either in water or on land surfaces, probably more or less accentuated or altered by the movements which produced the upheavals, subsidences, and flexures prevalent in the range.—On the alleged conversion of crystalline schists into igneous rocks in County Galway, by Dr. C. Callaway.—A preliminary inquiry into the genesis of the crystalline schists of the Malvern Hills, by Dr. C. Callaway. The author's researches amongst the crystalline rocks of Connaught had suggested certain lines of investigation which had subsequently been followed out in the Malvern district. He had satisfied himself that many of the Malvern schists had been formed out of igneous rocks; but at present he limited himself to certain varieties. The materials from which these schists were produced were diorite (several varieties), granite, and felsite. The metamorphism had been brought about by lateral pressure. Evidence of this was seen in the intense contortion of granite-veins and in the effects of crushing as observed under the microscope. The products of the metamorphism were divided into two groups:—(1) Simple schists, or those formed from one kind of rock. (2) Injection schists, formed by the intrusion of veins, which had acquired parallelism by pressure. Veins of diorite in diorite produced *duplex diorite-gneiss*, and veins of granite in diorite originated *granite diorite-gneiss*. It was further noted that (1) generally the particular varieties of schist occurred in the vicinity of the igneous masses to which they were most nearly related in mineral composition; (2) the mineral banding of the rocks in the field was more like vein-structure than stratification. The author accepted the received view of the age of the schists. The parallel structure was clearly antecedent to the Cambrian epoch, and the occurrence of similar rocks as fragments in the Uriconian conglomerate of Shropshire seemed to indicate that the Malvernian schists were older Archæan. The reading of this paper was followed by a discussion in which the President, Mr. Teall, Dr. Hicks, Colonel McMahon, Dr. Callaway, and Mr. Rutley took part.

Entomological Society, April 6.—Dr. David Sharp, President, in the chair.—Mr. Francis Galton, F.R.S., Mr. J. H. Leech, B.A., F.L.S., and Mr. G. S. Parkinson, were elected Fellows.—Mr. S. Stevens exhibited specimens of *Arctia mendica*, collected in the county of Cork. The peculiarity of the Cork form of the species is that the majority of the males are as white as the female of the English form, and the typical black or English form appears to be unknown in Cork.—Mr. McLachlan exhibited a zinc box used by anglers for the purpose of keeping living flies in, which he thought might be adapted to practical use in the field by entomologists.—Mr. G. T. Porritt exhibited specimens of *Hybernia progemmaria*, from Huddersfield. All the females and a large proportion of the males were of the dark variety *fuscata*, which formerly was almost unknown in Yorkshire, but which now seemed likely to replace the original type. Mr. Jenner-Weir and Lord Walsingham both remarked that the number of melanic forms appeared to be on the increase in the north, and suggested explanations of the probable causes of such increase.—Mr. Gervase F. Mathew, R.N., exhibited several new species of Rhopalocera taken by him in the Solomon Islands during the visits to those islands of H.M.S. *Espiègle* in 1882 and 1883. Amongst them were species of *Euplœa*, *Mycalesis*, *Messarus*, *Rhinopalpa*, *Cyrestis*, *Diadema*, *Parthenos*, *Pieris*, *Papilio*, &c.—Mr. E. B. Poulton exhibited a large and hairy lepidopterous larva brought from Celebes by Dr. Hickson, and made remarks on the urticating properties of the hairs of the species, which were said by the natives to produce symptoms similar to those of erysipelas if the larva was handled. Lord Walsingham, Mr. McLachlan, Dr. F. A. Dixey, Mr. Jenner-Weir, Dr. Sharp, Mr. Slater, and Mr. Poulton, took part in a discussion as to whether urtication was due to the mechanical action of the hairs in the skin, or to the presence of formic acid, or some other irritant poison, in glands at the base of the hairs. There appeared to be no doubt that in some species the irritation caused by handling them was merely due to the mechanical action of the hairs.—Mr. P. Crowley exhibited a collection of Lepidoptera recently received from West Africa, including several new or undescribed species of *Mylothris*, *Diadema*, *Harma*, *Rhomaleo-*

soma, &c.—Mr. H. Goss announced the capture by Mr. G. D. Tait, at Oporto, of a specimen of *Anosia plexippus*, and remarked that, although some twenty specimens had been caught in the South of England, only two specimens had been previously recorded from the continent of Europe.—Lord Walsingham read a paper entitled "A Revision of the Genera *Acrolophus* (Poey) and *Anaphora* (Clem.)"; and exhibited about twenty new species of these and allied genera. Mr. Stainton made some remarks on the genera, and said he was glad Lord Walsingham was working at them and their allies.—Mr. Poulton read "Notes in 1886 on Lepidopterous Larvæ." In the discussion which ensued, Lord Walsingham referred at some length to instances of protective resemblance in larvæ, and alluded to the existence in certain species, especially of the genus *Melitæa*, of prothoracic glands.—Dr. F. A. Dixey remarked on the extraordinary powers of contraction which appeared to be possessed by the retractor muscle of the flagellum in *D. vinula*, and inquired whether any corresponding peculiarities of minute structure had been observed in it. The discussion was continued by Mr. G. F. Mathew, Mr. W. White, Dr. Sharp, Mr. Porritt, and others.

PARIS

Academy of Sciences, April 18.—M. Janssen, President, in the chair.—On an absolute unity of time; electric standards of time and chronoscopes of their variations, by M. Lippmann. It is shown that from the study of certain electric phenomena an absolute invariable unity of time may be obtained. The electric apparatus here described yields more accurate results than the best constructed astronomical clock. It has the further advantage of indicating, recording, and, where needed, automatically correcting, its variations of velocity.—Solar observations made at Rome during the first quarter of the year 1887, by M. Tacchini. The period of minimum activity for the spots and faculæ, as recorded in November 1886, has continued throughout the first three months of 1887. The protuberances also continued to decline during the same period.—On antipyrine, an antidote against pain, by M. Germain Sée. Antipyrine, with the formula $C_{11}A_{12}N_2O$, discovered by Knorr in 1884, is shown to be not only a good febrifuge, but also a most efficacious remedy for gout, rheumatism, and similar affections.—On the earthquake of February 23, by M. J. L. Soret. Certain derangements of the telephonic apparatus in the central office at Cannes seem to show that the violent shock which occurred at 5.50 a.m. was accompanied by strong electric discharges.—On a special circumstance connected with the production of the bicarbonate of soda, by M. Paul de Mondésir. An experiment here described shows that the carbonate of soda, combined with a single equivalent of water, scarcely absorbs carbonic acid at the ordinary temperature at all. But when it is mixed with a slight portion of dry bicarbonate the reaction on the contrary begins at once, and with an energy in direct proportion to the quantity of the bicarbonate and the thoroughness of the mixture.—Method of determining the relative value of the four unities of chemical action of the atom of carbon, by M. Louis Henry. At the base of the doctrines of organic chemistry as now understood lie the two principles of the quadrivalence of the atom of carbon, and the identity in value of its four unities of chemical action. The former is an accepted fact proved by experiment, while the latter is far from possessing the same degree of objective certainty. The author here proposes a method by means of which its truth may be rigorously determined.—Artificial reproduction of rose-red spinel (balas ruby), by M. Stanislas Meunier. The author, who has been for several years incidentally occupied with the synthesis of spinel, has lately again attacked the problem in a way quite different from his first method. He now crystallises the aluminate of magnesia, tinted a rose colour by traces of chromium, the result being a stone absolutely identical with the balas ruby of nature. The experiment here described has already been varied in several ways, yielding a series of products, such as the aluminates of zinc, iron, &c., besides secondary compounds, whose study is still in progress.—On the functions of the semicircular ducts, by M. J. Steiner. From experiments made on Crustaceans at the Zoological Station at Naples, the author shows that these organs exercise little or no influence on the locomotion of the lower animals, as supposed by Delage, Viguer, and others.—On a station of the Stone Age discovered at Chaville, by M. E. Emile Rivière. This station of Chaville lies on the skirt of the wood of like name on the right side of the road between Paris and Versailles. Here the author has just discovered a large number of flint implements of the Neolithic epoch, scrapers, knives, arrow-heads, and the like. All lay on or near the surface, and were of a more or less deep gray colour, some showing clear traces of the action of fire. They closely resemble the objects found by the author at the Neolithic station of Trou-au-Loup, Clamart, in 1884-85. Amongst them was a small fragment of black, siliceous pottery without any ornamentation, and also perfectly analogous to the pottery of the Neolithic beds in the same neighbourhood.—The members of the International Conference on Celestial Photography were present at the sitting, and were welcomed by the President in an appropriate address dwelling especially on the importance for astronomy of the photographic labours of MM. Henry, of Paris.

BOOKS, PAMPHLETS, and SERIALS RECEIVED

Hyderabad, Kashmir, Sikkim, and Nepal: Sir R. Temple and Capt R. C. Temple (Allen).—Geology of England and Wales, 2nd edition: H. B Woodward (Philip).—An Elementary Treatise on the Mathematical Theory of Perfectly Elastic Solids: W. J. Ibbetson (Macmillan).—Dynamics for Beginners; Rev. J. B. Lock (Macmillan).—Catalogue of Lizards, 2nd edition, vol. iii.: G. A. Boulenger (British Museum).—Mineral Resources of the United States, 1885 (Washington).—Photography of Bacteria: E. M. Crookshank (Lewis).—Chemistry for Beginners: R. L. Taylor (Low).—Woodland Tales: J. Stinde (Unwin).—Geological and Natural History Survey of Minnesota, 13th and 14th Annual Reports: W. H. Winchell (St. Paul).—Longmans' New Geographical Readers, Standard VII. (Longmans).—The Prevention of Consumption: C. Candler (K. Paul).—Pictographs of the North American Indians: G. Mallery (Washington).—Der Bau des Menschen: Dr. R. Wiedersheim (Williams and Norgate).—Thomas Young: Prof. Tyndall.—Oberpliocän-Flora aus den Baugruben des Klärbeckens bei Niederrad und der Schleuse bei Höchst A. M.: Drs. Geyler and Kinkelin (Frankfort).—The Eruption of Krakatão: E. D. Archibald.—City Government of St. Louis: M. S. Snow (Baltimore).—Notes to Accompany a Geological Map of Northern Canada: G. M. Dawson (Montreal).—Etude Numérique des Concours de Compensation de Chronomètres: G. Cellérier (Genève).—Journal of the Royal Statistical Society, March (Stanford).—Zeitschrift für Wissenschaftliche Zoologie, xlv. Band, 2 Heft (Leipzig).—Bulletin de l'Académie Royale des Sciences de Belgique, No. 3 (Bruxelles).

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